CORONAVIRUS VACCINES – A BLUEPRINT FOR OTHER VACCINE DEVELOPMENTS?

Julia Bialek-Waldmann1, Leander Grode[1],

[1] Vakzine Projekt Management GmbH; Mellendorfer Strasse 9; 30625 Hannover; Germany;
grode@vakzine-manager.de

ABSTRACT

In December 2019, a series of pneumonia of unknown cause emerged in Wuhan, China, which developed into a global pandemic with more than 200 million cases and 4 million deaths worldwide as of August 2021. The enveloped RNA betacoronavirus which was found to cause the pandemic was named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). Academia and industry started with non-clinical and clinical development of several SARS-CoV-2 vaccine candidates immediately and results were achieved enormously fast. As an example, BioNTech and Pfizer got their joint SARS-CoV-2 vaccine approved less than eight months after trials started, while under normal circumstances vaccine development takes up to 10 – 15 years. In the case of the SARS-CoV-2 vaccine the extremely fast turnaround time from start of clinical trials to approval of the first vaccine candidates was driven by the urgent medical need and made possible by the mobilisation of enormous financial resources from the private and public sectors, as well as manpower and effort and the willingness of regulators to speed up timelines and approval processes.

Looking at the extremely fast and successful development of several SARS-CoV-2 vaccine candidates, it is difficult to understand from a layman's perspective why for others diseases like Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome (HIV/AIDS) and tuberculosis (TB), which are among the top ten causes of death worldwide, development of effective vaccines takes so long. More than 30 years after HIV has been discovered, there is still no vaccine available for prevention of HIV infection. Development of several vaccine candidates has failed in clinical trials. The difficulties stem in large part from HIV's unusual characteristics of replicating and mutating rapidly and high sequence diversity, its ability of immune system evasion and the creation of a persistent viral reservoir within the host. Development of the novel TB vaccine candidate VPM1002, which is designed to be a safe and effective vaccine for prevention of TB infection and TB recurrence, is an example of classical vaccine development. VPM1002 was invented in Germany, went through successful non-clinical development and is currently being tested in phase III clinical trial.

The achievements during the last year fast development of SARS-CoV-2 vaccines during the last year have proven that in case of a pandemic situation and an urgent medical need, fast vaccine development is possible. The achievements were reached with high financial commitment and regulators have shown willingness and engagement to accelerate timelines for review and approval processes. It would be desirable if further vaccine developments could benefit from these efforts.

Keywords: SARS-CoV-2, COVID-19, vaccine development

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